Nanyang Technological University

**Lab 2 Report:**

**Parametric Curves**

CZ2003 Computer Graphics and Visualization

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**Parametric Curves (Experiment on Resolution)**

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| **Curve 1** | **Curve 2** | **Note/Explanation** |
| A screenshot of “Straight Line Segment 1.wrl”. The equation of the line is x = u; y = u; z = 0 with parameter domain [0, 1]. The resolution is set to 100. | A screenshot of “Straight Line Segment 2.wrl”. The equation of the line is x = u; y = u; z = 0 with parameter domain [0, 1]. The resolution is set to 2. | Drawing of a straight line segment only requires very small resolution (even as low as 1) because the straight line segment only needs 1 line to be defined. |
| A screenshot of “Circle 1.wrl”. The equation of the curve is x = cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 1]. The resolution is set to 100. | A screenshot of “Circle 1.wrl”. The equation of the curve is x = cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 1]. The resolution is set to 10. | Drawing is done by connecting multiple lines between sampling points within the domain. The higher resolution the better. If the sampling resolution is set to 2, only 1 straight line will be displayed, but actually there are 2 identical lines. |
| A screenshot of “Circle Arc 1.wrl”. The equation of the arc is x = cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 0.2]. The resolution is set to 100. | A screenshot of “Circle Arc 2.wrl”. The equation of the arc is x = cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 0.2]. The resolution is set to 2. | Since the sampling resolution is 2, the arc in the “Circle Arc 2.wrl” is done by connecting 2 lines only. Hence, the higher resolution the better. |
| A screenshot of “Eclipse 1.wrl”. The equation of the curve is x = 0.5 \* cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 1]. The resolution is set to 100. | A screenshot of “Eclipse 1.wrl”. The equation of the curve is x = 0.5 \* cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 1]. The resolution is set to 3. | This example again shows the effect of sampling resolution to the accuracy of the outcome. |
| A screenshot of “Eclipse Arc 1.wrl”. The equation of the arc is x = 0.5 \* cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 0.25]. The resolution is set to 100. | A screenshot of “Eclipse Arc 2.wrl”. The equation of the arc is x = 0.5 \* cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 0.25]. The resolution is set to 2. | This case is similar to the case of the circle arc. |
| A screenshot of “2D Spiral 1.wrl”. The equation of the curve is x= u\*cos(6\*pi\*u); y = u\*sin(6\*pi\*u); z = 0 with parameter domain [0, 1]. The resolution is set to 100. | A screenshot of “2D Spiral 2.wrl”. The equation of the curve is x= u\*cos(6\*pi\*u); y = u\*sin(6\*pi\*u); z = 0 with parameter domain [0, 1]. The resolution is set to 12. | If the sampling resolution is set to 2, the result will be similar to the case of the circle: 1 straight line (but actually 2 identical lines) will be displayed. |
| A screenshot of “3D Helix 1.wrl”. The equation of the curve is x= cos(6\*pi\*u); y = sin(6\*pi\*u); z = u with parameter domain [0, 1]. The resolution is set to 100. | A screenshot of “3D Helix 2.wrl”. The equation of the curve is x= cos(6\*pi\*u); y = sin(6\*pi\*u); z = u with parameter domain [0, 1]. The resolution is set to 6. | If the sampling resolution is set to 2, only 2 zigzag lines will be displayed. |

**Parametric Curves (Experiment on Resolution)**

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| **Curves** | **Note / Explanation** |
| A screenshot of “2D Spiral 1.wrl”. The equation of the curve is x= u\*cos(6\*pi\*u); y = u\*sin(6\*pi\*u); z = 0 with parameter domain [0, 1]. The resolution is set to 100.    A screenshot of “2D Spiral 1.2.wrl”. The equation of the curve is x= u\*cos(6\*pi\*u); y = u\*sin(6\*pi\*u); z = 0 with parameter domain [0, 3]. The resolution is set to 100.    A screenshot of “2D Spiral 1.3.wrl”. The equation of the curve is x= u\*cos(6\*pi\*u); y = u\*sin(6\*pi\*u); z = 0 with parameter domain [0, 3]. The resolution is set to 300. | When the sampling domain of the spiral increases, the number of rotation increases, and the curve is elongated. Higher number of rotations would require a higher sampling resolution for better accuracy. |
| A screenshot of “Eclipse 1.wrl”. The equation of the curve is x = 0.5 \* cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 1]. The resolution is set to 100.    A screenshot of “Eclipse Arc 1.wrl”. The equation of the arc is x = 0.5 \* cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 0.25]. The resolution is set to 100.    A screenshot of “Eclipse 1.1.wrl”. The equation of the curve is x = 0.5 \* cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 10]. The resolution is set to 100.    A screenshot of “Eclipse 1.2.wrl”. The equation of the curve is x = 0.5 \* cos(2\*pi\*u); y = sin(2\*pi\*u); z = 0 with parameter domain [0, 10]. The resolution is set to 1000. | When the sampling domain reduced to [0, 0.25], the eclipse is reduced to an arc.  When the sampling domain of the eclipse is increased to [0, 10], the same eclipse is repeatedly drawn 10 times around the center point. However, the curve still enlongates, and the sampling resolution needs to increase for better accuracy. |